

ably when he walked from Hinton to Derby, a distance of more than one hundred miles, in three days almost without food or sleep, and its manifestation in later life is well illustrated by the statement that after the projection of the evolutionary system at the age of thirty-seven, "nearly everything I wrote had a bearing, direct or indirect, on the doctrine of evolution."

Among the characters of direct importance to his intellectual productiveness must be reckoned the freedom and spontaneity of his ideational processes. During boyhood trains of ideas were apt to occupy his attention for long periods excluding all awareness of his surroundings, and this seems to have been especially frequent during walking. He speaks of this free flow of ideas in boyhood as "castle-building," but names it "constructive imagination" when, in later life, owing to systematisation of interests, his ideational processes tended towards ends related to his general scheme of conceptions. This spontaneity of the ideational processes enabled him to reach his conceptions and conclusions with a minimum of voluntary effort and, indeed, his efforts were more often directed to the checking rather than, as with most of us, to the promoting of the flow of thought. The following passage describes this as well as another important mental trait.

"It has never been my way to set before myself a problem and puzzle out an answer. The conclusions at which I have from time to time arrived, have not been arrived at as solutions of questions raised; but have been arrived at unawares—each as the ultimate outcome of a body of thoughts which slowly grew from a germ. Some direct observation, or some fact met with in reading, would dwell with me: apparently because I had a sense of its significance. It was not that there arose a distinct consciousness of its general meaning; but rather that there was a kind of instinctive interest in those facts which have general meanings. For example, the detailed structure of this or that species of mammal . . . would leave little impression; but when I met with the statement that, almost without exception, mammals . . . have seven cervical vertebræ, this would strike me and be remembered as suggestive."

In this passage is indicated the last of the faculties of primary importance, the faculty of seizing upon facts or conceptions that were of significance for his scheme of thought, well illustrated by his adoption and extended application of von Baer's phrase "the change from homogeneity to heterogeneity." It was this subtle and ready working of selective attention that rendered unnecessary the storing in the memory of vast masses of facts, and enabled him to dispense with any very extensive reading. Spencer's "sporadic memory" was avowedly poor, and this fact, cooperating in youth with a constitutional idleness, a distaste for continued reading and an impatience of opinions with which he did not agree, and in later life cooperating with an incapacity for reading dating from the time of the writing of the "Psychology" (æt. 38), very effectively preserved him from that "accumulation of knowledge in excess of power to use it" which he deplored as one of the common results of the current educational methods and regarded as one of the principal sources of intellectual sterility in many

able men. It is an interesting question, How would Spencer's work have been modified had he devoted much time and energy to reading in place of passing restlessly from place to place, unable to bear solitude, constantly seeking to kill time, as he tells us, by various trivial occupations? Would extensive reading have choked the springs of production? There can be no doubt that, had his mental digestion proved equal to the task, a greater acquaintance with the history of thought would have enabled him to raise his works to a still higher level than that they actually attained—to secure for them an even more solid and enduring fame.

Of the further qualities that especially contributed to determine the character of his political and ethical doctrines, we may note a love of freedom, a quick sympathetic resentment of all injustice, a high valuation of pleasure for its own sake.

As to the general impression of the man produced by this autobiography, it seems certain that it is unduly harsh and unfavourable, for Spencer persisted with almost painful honesty and in accordance with the principle he had adopted, in laying stress upon the distinctive or peculiar features, while neglecting those more amiable traits which he shared with men in general. The result is that, whereas most biographies, and even autobiographies, are of the nature of a portrait, in which the artist selects an aspect and idealises to some extent the features of the subject, this one resembles rather a harsh, crude photograph that reproduces with relentless accuracy, and even gives undue prominence to, the lines and the warts, all the asperities of nature and all the bruises of the battle of life.

W. McD.

AMERICAN BIG GAME.

Musk-Ox, Bison, Sheep, and Goat. By C. Whitney and others. American Sportsman's Library. Pp. 284; illustrated. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1904.) Price 8s. 6d. net.

The Still-Hunter. By T. S. Van Dyke. Pp. viii+390; illustrated. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1904.) Price 7s. 6d. net.

THE members of the deer tribe, together with the pronghorned antelope, or prongbuck, having been described in an earlier volume of the same series, the work standing first in our list completes the account of the wild ruminants of North America. The names of the authors—Mr. C. Whitney for the musk-ox, Mr. G. B. Grinnell for the bison, and Mr. O. Wister for the mountain sheep and the white goat—form a sufficient guarantee that the text of this volume will combine that mixture of sport and natural history for which the true sportsman always looks in works of this nature, and a glance at its pages shows that such is really the case. From title-page to index the method of treatment and the style of writing are admirable, so admirable, indeed, that there is scarcely a sentence to which exception can be taken.

One admirable feature is that all three authors have

agreed to adopt one system of nomenclature, selecting that of Mr. Rowland Ward's "Records of Great Game." Not only is this satisfactory from the point of view of uniformity, but it indicates, in some degree at any rate, a tendency to revolt against the American practice of regarding every colour-phase of an animal as representing a distinct species. Accordingly we find all the American forms of wild sheep included under a single specific heading. In the case of the musk-ox, the author has indeed seen fit to depart from this admirable practice, classing the East Greenland animal as a species apart from the typical *Ovibos moschatus* of the Barren Grounds. Moreover, he is not justified in suggesting that the name *O. m. wardi* (first proposed in our own columns) should give place to Dr. Allen's *O. pearyi*. Doubtless Lieut. Peary has more claim to have a musk-ox named after him than has Mr. Rowland Ward, but if we are to disregard the rule of priority in regard to names of recent origin, zoology will soon be in a state of hopeless chaos.

Since the history of the bison has been written and re-written over and over again, the portion of the present volume dealing with the musk-ox has greater claims to novelty than have the chapters devoted to the first-named animal. Mr. Whitney's account of the extreme difficulties and hardships inseparable from an expedition into the Barren Grounds shows that musk-ox hunting is by no means holiday work, and that even when plans have been most carefully laid, a trip may result in failure even to sight the game. Perhaps it is not generally known that previous to the author's venture the only extensive trips that had been made into the Barren Grounds were those of the two Englishmen, Mr. Warburton Pike and Mr. H. T. Munn.

As a companion to the preceding excellent volume and its fellow in the same series, "The Deer Family," Mr. Van Dyke's "The Still-Hunter" may be heartily commended. Written more exclusively from the sportsman's point of view, it deals in considerable detail with the technique of stalking—or "still-hunting" as our American friends term this kind of sport—and is especially devoted to the pursuit of the white-tailed and mule deer and the prongbuck. As we learn from a statement on the back of the title-page and the preface, this volume is a new and illustrated edition of a work which originally appeared so long ago as 1882 or thereabouts. But it is none the worse for this, since it not only describes American deer-stalking in its palmy days, but is thoroughly up to modern requirements in the matter of rifles and other essentials of sport.

The illustrations, which are both numerous and artistic, are nearly all drawn for a special purpose, and serve to indicate both the impediments and the facilities with which the sportsman is likely to meet in the pursuit of his quarry. While the earlier chapters are devoted to a description of the manner in which to recognise good hunting grounds, and the various methods of tracking and shooting deer, the later ones treat more especially of rifles and how to use them, with a discussion on the type of bullet and the charge of powder best suited to this kind of sport.

If the big-game sportsman who intends to shoot in America be provided with the volume heading this notice and its companion on the "Deer Family," together with Mr. Van Dyke's "Still-Hunter," he may consider that, so far as literature is concerned, he is thoroughly equipped for his task. The first two volumes have, in addition, no small amount of interest for naturalists of all countries.

R. L.

THE ORBIT OF A PLANET.

Grundriss der theoretischen Astronomie und der Geschichte der Planetentheorien. Zweite vermehrte Auflage. By Prof. Johannes Frischauf. Pp. xv + 199. (Leipzig: Wilhelm Engelmann, 1903.)

THE title of this work is too comprehensive; an outline of theoretical astronomy might be expected to touch at least gravitational theory, even if other physical sections were omitted. Prof. Frischauf's work—the first edition of which appeared in 1871—is engaged almost exclusively with the geometrical problem of finding an orbit from observation, and with a detailed history of Kepler's search for the true form of a planet's orbit. It is intended as an introduction, and is not ambitious for completeness; indeed, it omits many things a student might well be told, which would not have broken its attractive readable quality. For example, there are many better approximations for solution of Kepler's problem than that given on p. 6, and the well known graphical solution with the help of the curve of sines is not mentioned; this should not be omitted, for it is a method of real utility, and with proper care can be worked, as Bauschinger says, with an error not exceeding a tenth of a degree.

The author is well advised in following Gauss closely; it is almost inevitable that the work should be largely composed of excerpts from the *Theoria Motus*, and a writer serves his readers best who does not disguise them. But the numerical examples would have gained by being less faithful. The practice of astronomers in their reductions has undergone very great changes, and justice is not done to it by a note such as that at the bottom of p. 74, where, in reference to certain places of the sun extracted by Gauss directly from the tables—von Zach's presumably—Prof. Frischauf explains that our procedure is now less primitive.

Those who prefer to read Gauss and Olbers in the original, or in the masterly handbooks of Watson or Oppolzer, will find plenty to interest them in the third part of this work. Under a title of the history of the planetary theory, Prof. Frischauf gives, along with a cursory account of the rest of the history, a most interesting detailed story of Kepler's successive efforts to obtain the true form of a planet's orbit. Prof. Frischauf remarks that there are few more interesting pieces in the history of science; yet very few authors have allowed themselves space to do it justice. Dr. Frischauf, as professor at Gratz, is the appropriate man to write upon Kepler, for Kepler himself was a lecturer on mathematics at Gratz, and there made his name as an astrologer. The penetration of the older theories deserves more recognition than it gets; it is but little known how